

The *Kepler* Mission Star Field

The Kepler Mission Star Field

Kepler is NASA's first mission capable of finding Earth-size planets in the habitable zone of stars similar to our Sun.

Selecting the Kepler Star Field

The star field for the *Kepler Mission* was selected based on several factors:

1. The field had to be continuously viewable throughout the mission.
2. The field needed to be rich in stars like our Sun. *Kepler* needs to observe over 100,000 stars all at once.
3. The starfield had to be visible for half of the year from northern hemisphere observatories.

Kepler observes an area of sky near the plane of our Milky Way galaxy where there is a rich star field. To preclude interference from the Sun, *Kepler* needed to point more than 55° away from the path of the Sun in either the northern or southern sky. The Cygnus-Lyra region in the northern sky was chosen because the ground-based telescopes needed for *Kepler* follow-up observation are located in northern latitudes. The selected field is centered on RA=19^h22^m40^s and Dec=+44°30'00" (J2000).

The Milky Way photograph (on reverse) shows the *Kepler* field of view. It is located between two of the brightest stars in the sky, Vega and Deneb, which along with Altair form the summer triangle. The three stars of the summer triangle are part of the constellations Cygnus, the swan; Lyra, the harp; and Aquila, the eagle. The field is directly overhead at midnight in late July for mid-northern latitudes. The star field is about 15° across or bigger than your hand held out at arm's length. This is an enormous field of view compared to that of most astronomical telescopes. The *Hubble Space Telescope* field of view

is only about the size of a grain of sand held out at arm's length.

Distances to the Kepler Stars

The illustration below shows the shape of our galaxy and the location of our Sun relative to the galactic center. The Sun is about 25,000 light years from the center of the galaxy, about half the distance from the center to the edge. The yellow cone shows the region of the Milky Way that *Kepler* views. *Kepler* looks along a spiral arm of our galaxy. Most of the Sun-like stars in the *Kepler* search space are 600 to 3,000 light years distant. These are the stars where *Kepler* can detect Earth-size planets. Stars farther away than about 3,000 light years are too faint for *Kepler* to observe the transits needed to detect Earth-size planets.

What are the Squares on the Kepler Mission Star Field?

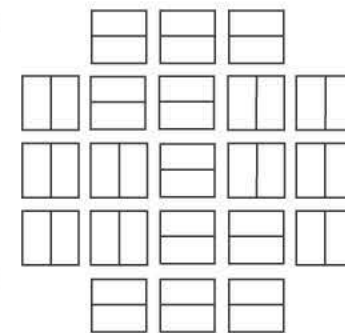
Kepler measures the light coming from over 100,000 stars using charge-coupled devices

(CCDs). The CCDs are similar to those used in consumer digital cameras for taking pictures. However, unlike a digital camera of several megapixels, *Kepler's* photometer has a total of 95 megapixels.

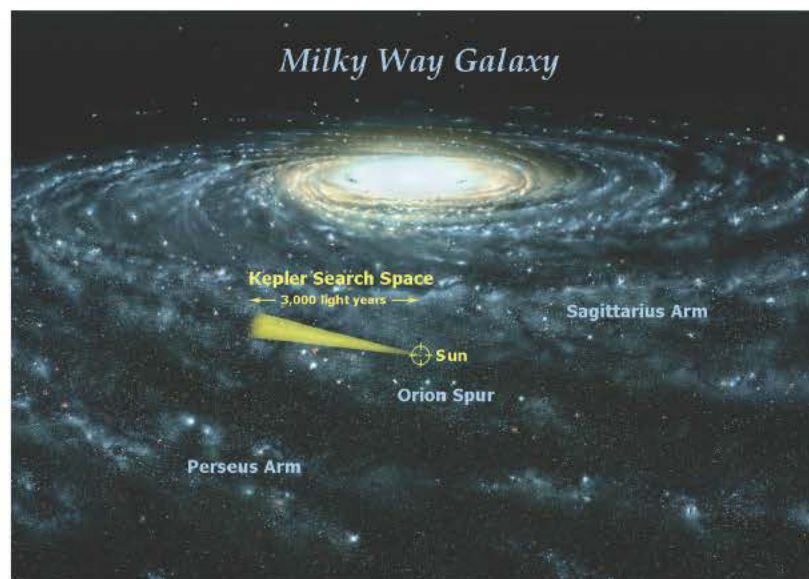
The Milky Way

photograph (reverse)

shows the orientation on the sky of the detector array of 42 CCDs. Two CCDs form a square module with each of the 21 modules covering about 5 square degrees of the sky. Each CCD is about 3x6 cm in size. The gaps between the CCD modules are the size of the full Moon, ½ degree wide, and the brightest stars fall into the gaps so that *Kepler* can search for the dimmer Sun-like stars. The entire field of view covered by the *Kepler* detector array is more than 100 degrees square.



Layout of the 42 CCDs.



Region of the Milky Way Galaxy viewed by Kepler.

Learn more by visiting the
Kepler website
<http://kepler.nasa.gov>
and
<http://www.nasa.gov/kepler>

Milky Way images: Amateur astronomer, Carter Roberts, photographed the Milky Way (reverse) and space artist, John Lomborg, painted the Milky Way Galaxy.